Hole's Human Anatomy and Physiology

Twelfth Edition

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Chapter 4 Cellular Metabolism

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4.1: Introduction

- **Metabolic processes – all chemical reactions that occur in the body**

There are two (2) types of metabolic reactions:

- **Anabolism**
  - **Larger molecules are made from smaller ones**
  - **Requires energy**
- **Catabolism**
  - **Larger molecules are broken down into smaller ones**
  - **Releases energy**

4.2: Metabolic Processes

- **Consists of two processes:**
  - **Anabolism**
  - **Catabolism**

Anabolism

- **Anabolism provides the materials needed for cellular growth and repair**
- **Dehydration synthesis**
  - **Type of anabolic process**
  - **Used to make polysaccharides, triglycerides, and proteins**
  - **Produces water**

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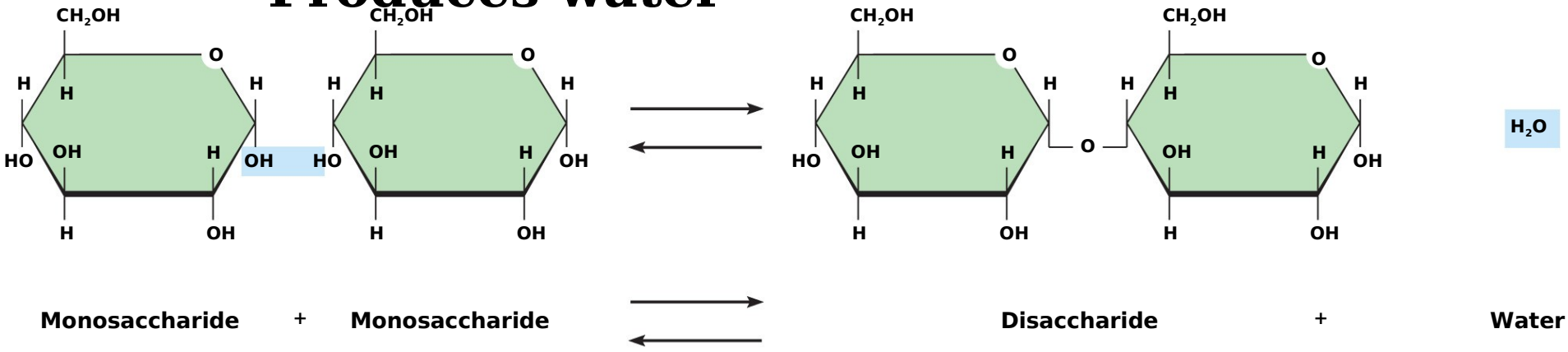

Anabolism

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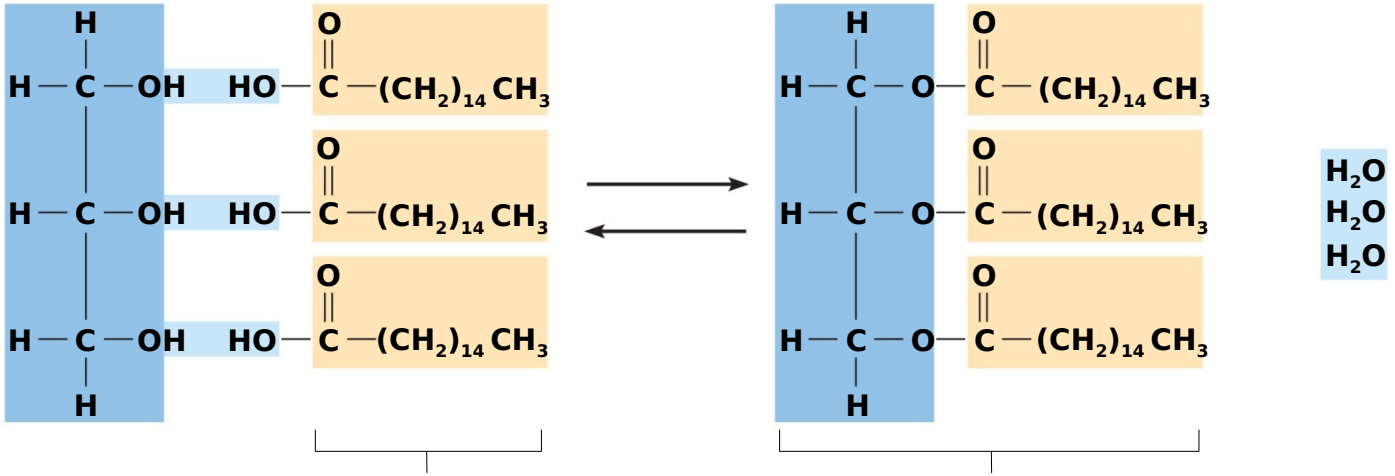

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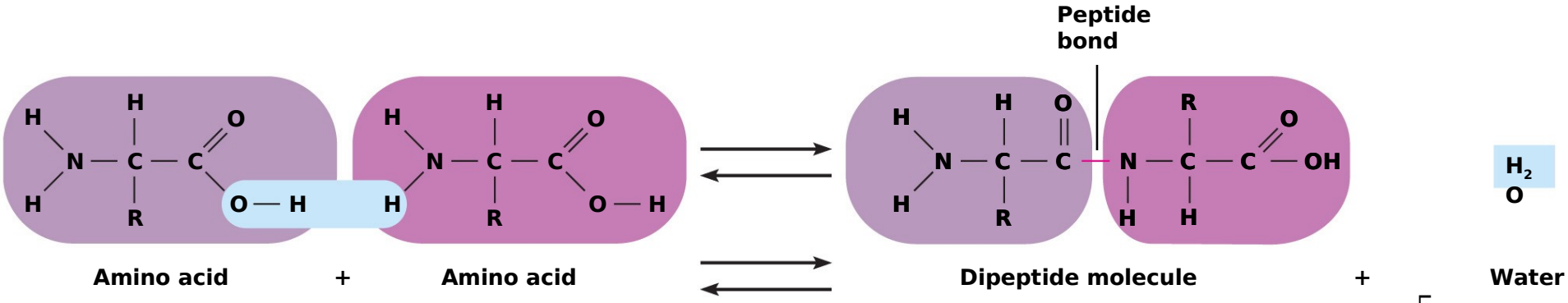

Catabolism

atabolism breaks down larger molecules into smaller

Hydrolysis

- **A catabolic process**
- **Used to decompose carbohydrates, lipids, and prote**
- **Water is used to split the substances**
- **Reverse of dehydration synthesis**

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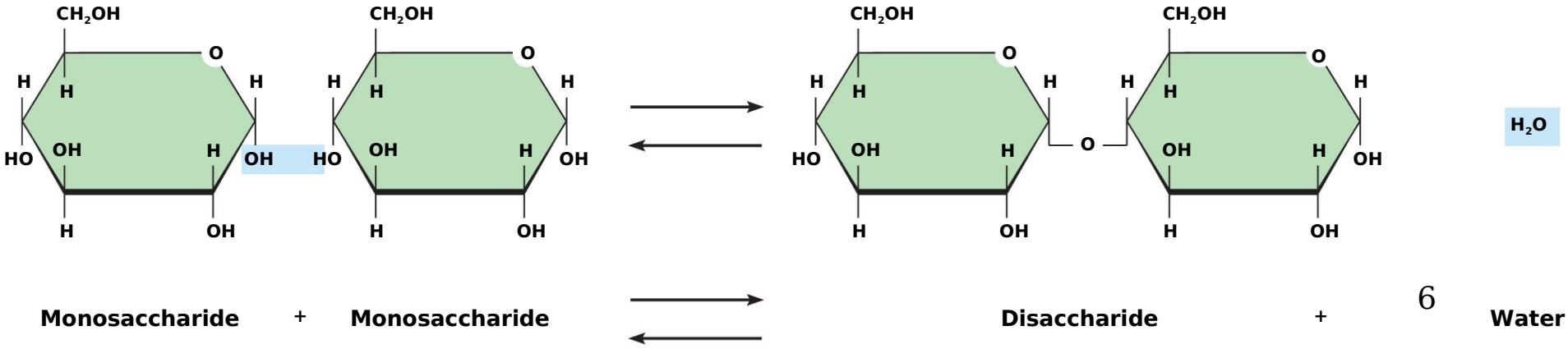

Catabolism

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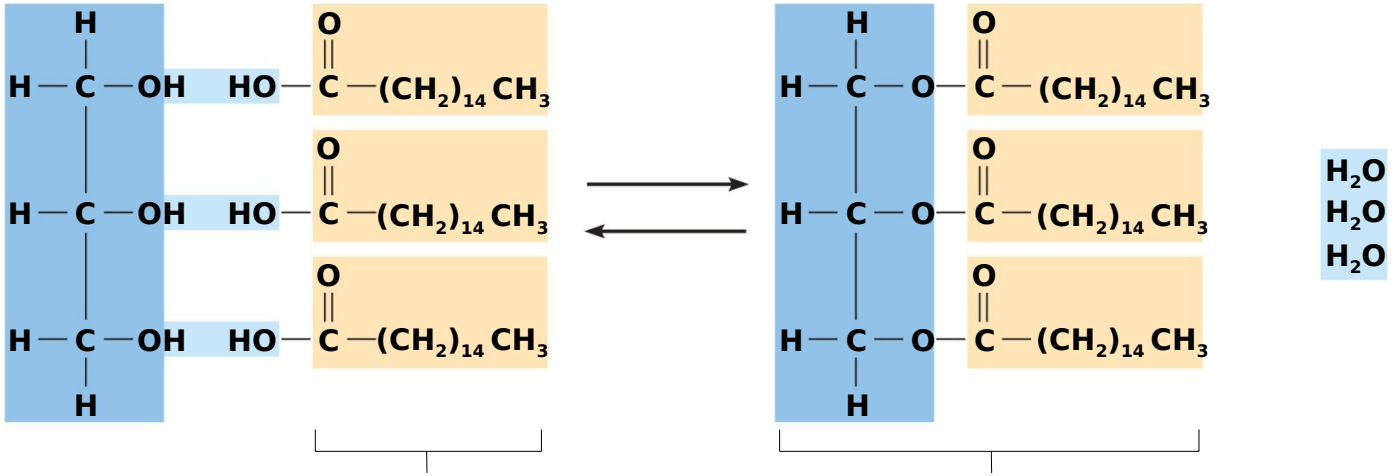

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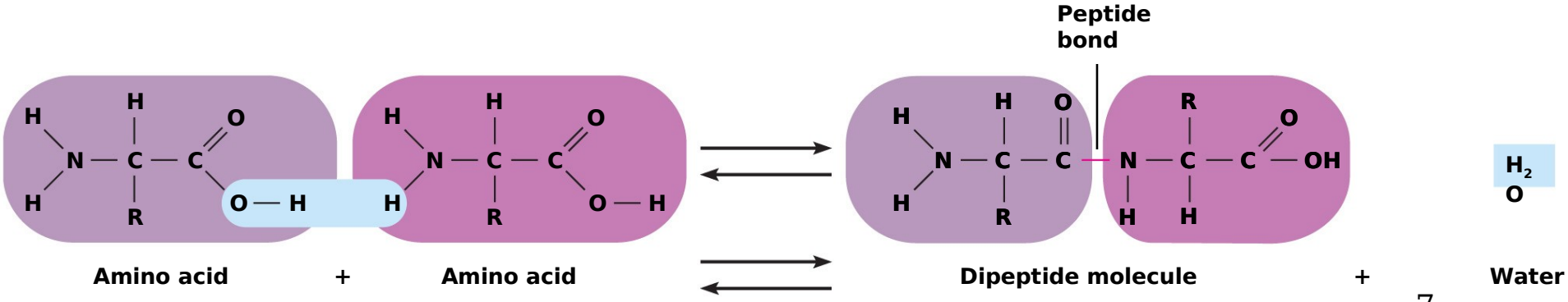

4.3: Control of Metabolic Reactions

- **Enzymes**
- **Control rates of metabolic reactions**
- **Lower activation energy needed to start reactions**
- **Most are globular proteins with specific shapes**
- **Not consumed in chemical reactions**
- **Substrate specific**
- **Shape of active site determines substrate**

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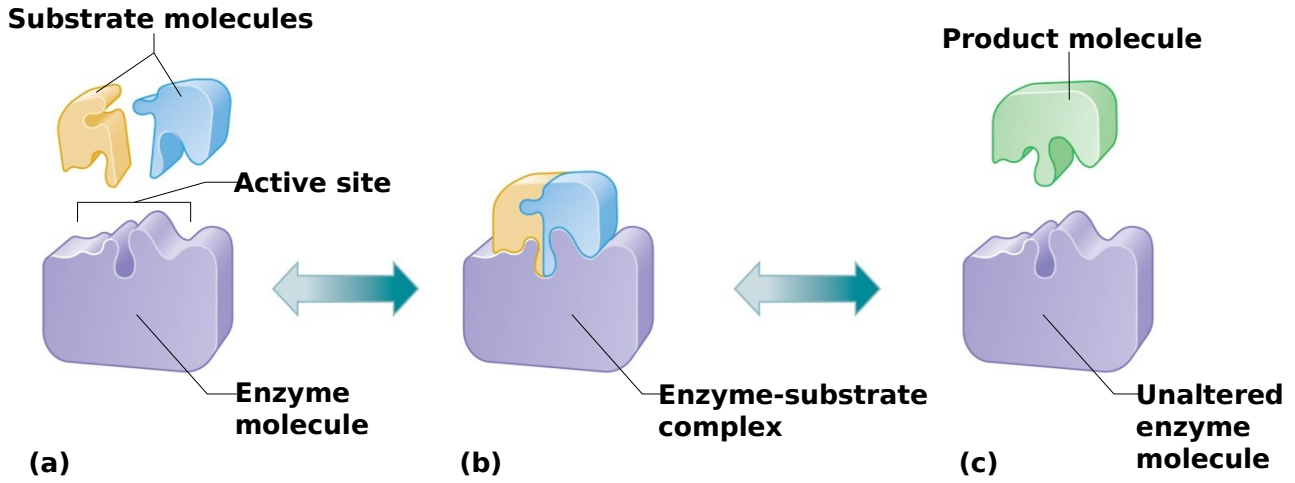

Enzyme Action

- **Metabolic pathways**
  - **Series of enzyme-controlled reactions leading to formation of a product**
  - **Each new substrate is the product of the previous reaction**

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- **Enzyme names commonly:**
  - **Reflect the substrate**
  - **Have the suffix – ase**
  - **Examples: sucrase, lactase, protease, lipase**

Cofactors and Coenzymes

- **Cofactors**
  - **Make some enzymes active**
  - **Non-protein component**
  - **Ions or coenzymes**
- **Coenzymes**
  - **Organic molecules that act as cofactors**
  - **Vitamins**

Factors That Alter Enzymes

- **Factors that alter enzymes:**
  - **Heat**
  - **Radiation**
  - **Electricity**
  - **Chemicals**
  - **Changes in pH**

Animation: How Enzymes Work